A Publication of Communication Channels, Inc

DECEMBER 1986

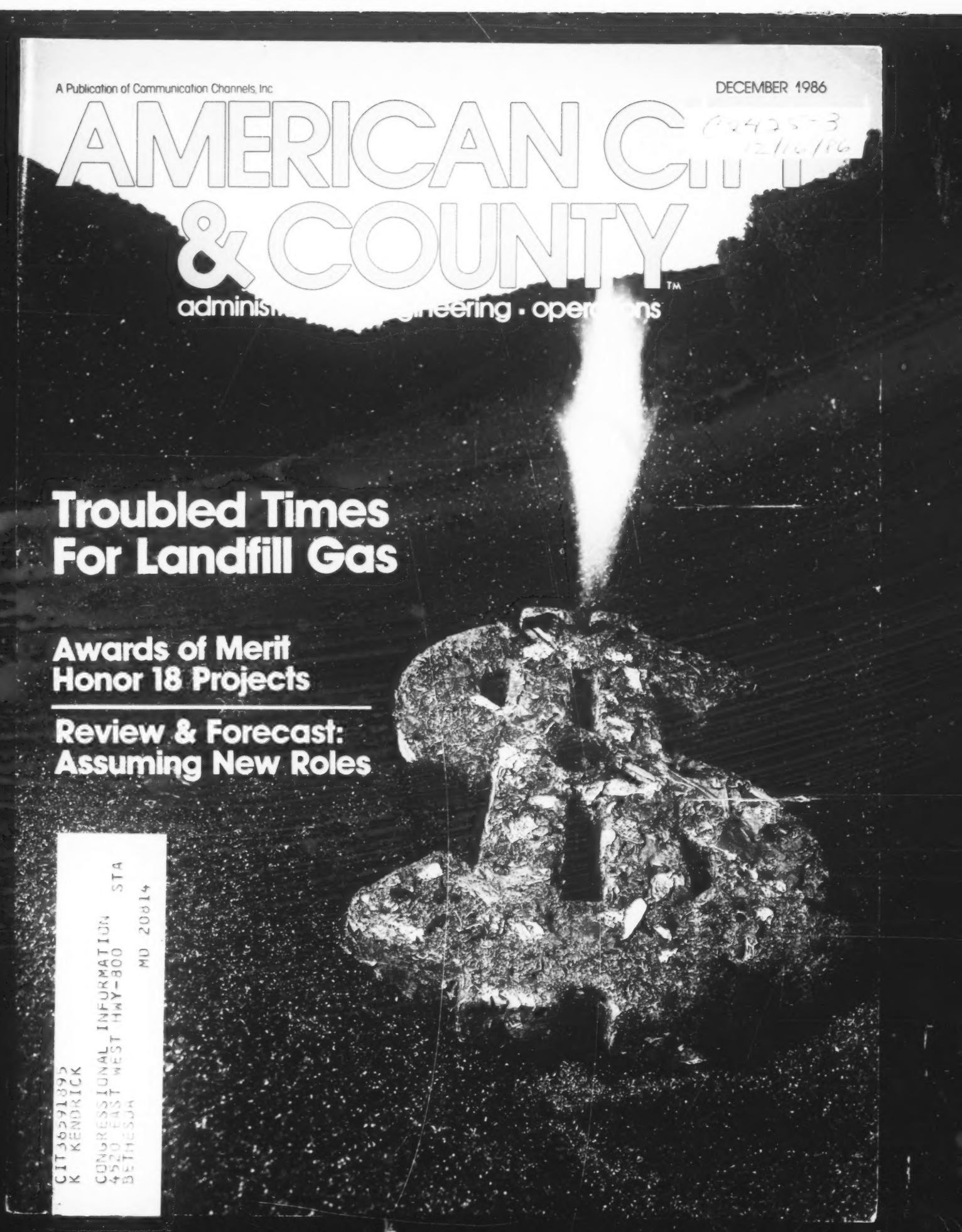
AMERICAN CITY & COUNTY™

administration · engineering · operations

Troubled Times For Landfill Gas

Awards of Merit Honor 18 Projects

Review & Forecast: Assuming New Roles



CIT36291890
K KENDRICK
CONGRESSIONAL INFORMATION STA
4520 EAST WEST HWY-800
BETHESDA MD 20814

A Publication of Communication Channels, Inc

AMERICAN CITY & COUNTY

administration · engineering · operations

BPA

December 1986 Vol. 101, No. 12

FEATURES

22 Troubled Times for Landfill Gas
Declining revenues and a new emphasis on environmental controls are spelling hard times for the landfill gas recovery industry.

25 ☐ Landfill Siting and Public Involvement
26 ☐ Iron Topping Extends Floor Life
30 ☐ Emissions Studied

32 Looking Back, Looking Ahead
Funding cuts, program losses and redefined roles combined to make 1986 a year of changes, and members of the *American City & County* Editorial Advisory Board say 1987 could be as unpredictable.

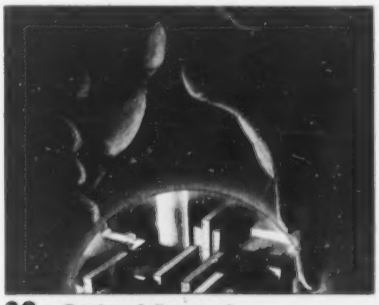
32 ☐ Changes Sweep Across Local Landscapes
34 ☐ Three Strategies May Aid Transition
34 ☐ Local Government Costs To Increase
36 ☐ The Tools Exist To Survive Cutbacks

38 Local Achievements Merit AC&C Honors
Distinctive projects from coast to coast earn *American City & County's* Awards of Merit, recognizing creative solutions to vexing local problems.

40 ☐ Partnership Works for Santa Clara
40 ☐ Jacksonville Drive-up Speeds Service
40 ☐ Amite City, La., Computerizes Billing
40 ☐ Public/Private Effort Aids Houston Park
41 ☐ Cobb Attacks Litter with Watchdog Program
41 ☐ Morris County, N.J., Saves Rail Line
42 ☐ San Francisco System Cuts Sewage Overflows
43 ☐ Bellingham, Wash., Spruces Up Street
45 ☐ Hanford, Calif., Spurs Private Investment
46 ☐ Missouri Cities Tap Water Supply

About the Cover

The landfill gas recovery industry is suffering from low energy prices and tougher government regulations. Cover story begins on page 22. (Photo by Terri Teague of Atlanta.)



32 Review & Forecast

38 And the winners are...

DEPARTMENTS

20 Across America
6 Calendar
57 Classified
4 Editor's View
12 Financial Management
10 Inside Washington
50 Literature
60 Municipal Cost Indexes
48 New Products
16 Newsmakers
14 Office Automation
54 Professional Services
47 Resource Recovery
49 Services & Contracts

American City & County is published monthly by Communication Channels, Inc., George E. Fowkes, Chairman of the Board; B. J. Kotsher, President; Scott Smith, Secretary; Buford Bryant, Treasurer. Editorial and advertising offices at 6255 Barfield Road, Atlanta, GA 30328. Telephone 404-256-9800. American City & County is a registered trademark of Communication Channels, Inc. © 1986 by Communication Channels, Inc. Application to mail at Second Class Postage paid at Atlanta, GA and at additional mailing offices. Subscription rates: U.S.A., 1 year $42; 2 years, $70; Canada and Mexico, 1 year, $45; Foreign, 1 year, $60; overseas air mail, $82. Single copies, $3.50. The opinions expressed by authors and contributors to American City & County are not necessarily those of the editors or publisher. Articles appearing in American City & County may not be reproduced in whole or in part without permission of the publisher. Microfilm copies of American City & County are available from Xerox University Microfilms, Ann Arbor, MI 48109. Postmaster: Please send form 3579 to Circulation Department, American City & County, 6255 Barfield Road, Atlanta, GA 30328.
ISSN 0149-337X

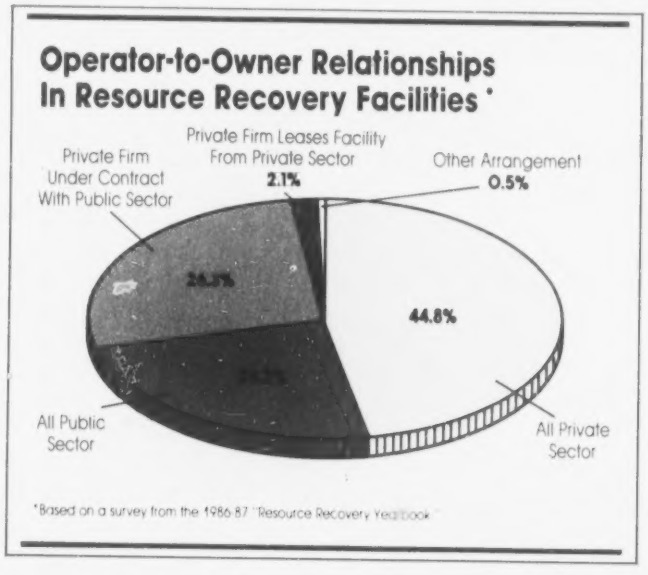
By Elizabeth A. Burns

Resource Recovery Credit Considerations

Decisions made early in the design of resource recovery facilities can have a lasting impact on the credit-worthiness of the bonds issued later to finance the projects. These bonds will be supported in whole or in part by revenues generated by the facility, so bond rating agencies, insurers and credit enhancement providers will scrutinize any factor that could affect a prospective facility's income and operating costs.

Due to the financial risks inherent in the large scale and economic and technological complexity, resource recovery projects necessitate contractual agreements. The primary ones are between the vendor and the sponsoring governmental unit, agency or authority. The terms of the construction and long-term operating agreements, collectively called the "service agreement," are crucial to the project's cost and the securing of financing.

In many resource recovery projects, a local government entity selects a single private company to design, build, operate and perhaps own the facility. The contract with the vendor will include construction, performance and operating guarantees, but those guarantees are not meaningful unless the vendor has the financial ability to meet its obligations. Credit analysts will scrutinize not only the nature and extent of the vendor guarantees, but also the vendor's experience and reputation, financial performance, and credit ratings. The vendor's key subcontractors also will be reviewed.


Operator-to-Owner Relationships In Resource Recovery Facilities *
Private Firm Under Contract With Public Sector
Private Firm Leases Facility From Private Sector
2.1%
Other Arrangement
0.5%
44.8%
All Public Sector
All Private Sector
*Based on a survey from the 1986-87 "Resource Recovery Yearbook"

The two basic types of resource recovery facilities, mass burn and refuse-derived fuel, present a wide range of other technological options. Some technologies have a more trouble-free operating record than others. Credit analysts are most comfortable when evaluating projects similar in size and technology to others that already have proven viable.

Many resource recovery projects are sponsored by newly created authorities, which have no credit or operating history. This complicates the credit process. Credit analysts will consider the authority's structure and its power under the law, but, ultimately, the analysts have to look beyond the authority to the represented community. The community's demographics, economic prospects, contractual commitments under the service agreement, the structure for securing its obligations, and ability to cover the service fee payments (including debt service) will be considered.

Key aspects of the service agreement that will concern the credit analysts include: the allocation of risks between the vendor and the community during construction and operation; the default and termination provisions, which include penalty payments and responsibility for debt service or payment of the bonds if a facility's operations are interrupted or terminated; the structure of the service fee, including the disposition of energy sales revenues or tipping fees exceeding contract minimums; and the level of the community's waste guarantee (the "put-or-pay" commitment) in relationship to the facility's size.

Credit analysts will review energy sales agreements to see how they coordinate with the service agreement and the economics of the project. Federal regulations require public utilities to purchase power from a facility that qualifies as a small power producer, but a contract with the utility is necessary to assure investors future revisions or repeal of federal regulations will not affect the project's economics.

Credit analysts' review of power contracts with utilities will focus on the term, the "take-or-pay" (a guarantee of payment regardless of whether the utility actually takes the power) provisions, events of default and termination rights. But in reviewing contracts with private, industrial energy purchasers, such as steam customers, analysts will look at a company's financial performance, industry position and other factors affecting its stability as a steam user.

To provide a meaningful "put-or-pay" commitment, a community must have some method of controlling the disposal of waste, either by law or through contracts with participating municipalities. Contracts with private haulers generally are considered insufficient guarantees, unless they are major, long-range players in the industry.

Other considerations influencing the credit-worthiness of a resource recovery project include the structure of the debt, such as variable rate, short- or long-term, and the method and timing for contributing equity, if applicable.

Factors outside the community's control, such as the state and federal regulatory climate, may include rate regulation, taxing powers, procurement law, debt-issuing restrictions, the bond allocation process, the likelihood of litigation, and the availability of insurance.

As actual operating experience by more facilities validates or alleviates analysts' concerns, the importance of some of these factors will change. A growing success record with these facilities also will reduce the close scrutiny now accorded secondary credit factors, and the demands placed on vendors and communities will become less stringent.

The greatest impetus for change in structuring the financing of these projects is the tax reform bill. Under the new act, the tax benefits available to private owners are reduced greatly and, because of lower corporate tax rates, are significantly less attractive.

Finally, as more experience with public ownership accrues, communities will begin to restructure the guarantees, risks and the economic benefits to which they are willing to commit. □

Elizabeth A. Burns is managing consultant for Public Financial Management Inc., Philadelphia.

Mapping Systems Boost Productivity

By Joseph H. Cooper

Municipalities and government agencies throughout the country are seeking an economical and reliable automated mapping system. This need extends beyond the mechanization or simple drafting functions to include true integration of the total mapping function with other record-keeping tasks.

Such automated mapping/facilities management systems are needed to provide important record-keeping and operation capabilities for the engineering, planning and administrative functions of local government.

Automated mapping systems have existed since the late 1960s, but implementing and fully integrating a system into an operating environment often has been an expensive, complex and lengthy process. In the past, most mapping systems have been implemented on dedicated graphic machines, which operate on a stand-alone basis and are very expensive. The workstations used with these machines are complex pieces of equipment, assembled from component devices and customized to the particular system.

Thus, the conventional, digital mapping machine requires highly specialized equipment and software dedicated to the mapping function. As a result, conventional mapping systems have been too complicated and expensive for most municipalities.

Most conventional mapping systems are based on the concept of the shared computing resource, in which graphics computations for all workstations are performed by a single, central processing unit. As long as the total computation needs to support the workstation do not overload the unit's capacity, the system will perform adequately. But if the central computer becomes overloaded or additional workstations are needed, only two options are available: buy a larger machine to gain additional capacity or accept the system's degraded performance and capacity.

Fortunately, computer technology has advanced during the past five years, with personal computers (PCs) emerging as a major force. These powerful but inexpensive machines have significant graphic capabilities and are obvious candidates for mapping applications. With PC capacity increased, and costs reduced dramatically, the microcomputer has brought about new software technology, providing a better and less expensive way to accomplish the mapping function.

Today, new approaches to mapping make automating this function a realistic and affordable option. Standard, low-cost, off-the-shelf microcomputers are being used as independent, distributed graphics processors. These "PC-type" machines are combined with standard video display devices, digitizing boards and plotters to serve as fully functional graphic workstations. These microcomputer mapping services offer a full range of capabilities and an unlimited growth capacity at a fraction of the cost of the older stand-alone systems. Most of their inherent limitations also have been eliminated.

The key to this new approach is a distributed network of PC-based workstations linked to a centralized database of mapping information on a host computer. When a map needs to be updated, the PC mapping workstation uses the host machine to retrieve the mapping information. Then the workstation disconnects and performs the mapping functions as an independent machine. This distributed mapping approach permits many workstations to perform mapping tasks simultaneously without degrading each other's performance or interfering with the performance of the host database computer.

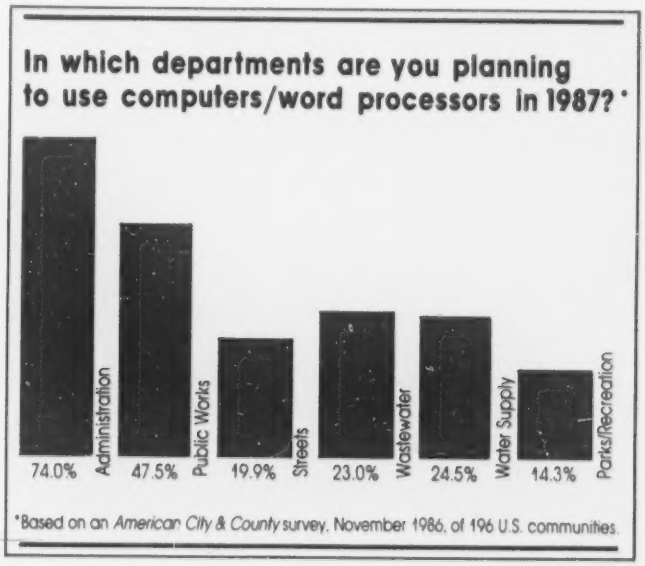
The distributed microprocessor-based system differs dramatically from traditional AM/FM systems in a number of important ways.

This new approach uses a multi-processor environment. Each workstation is an independent computer with its own memory, computing resources, local data storage, and input and output devices. No critical computing resources are shared. Thus, the performance of any workstation is not affected by the processing being performed by other users of the system. As a result of this multi-processor approach, the capacity of the system can grow indefinitely by adding more workstations whenever they are needed.

Secondly, this new approach uses a multi-system environment. An independent host computer is used to store the graphics data for all workstations in a centralized database. This means the individual workstations do not require significant data storage capacity because the functions of map manipulation and map storage are completely separated. The independent host machine simply stores and makes available the mapping information as needed.

A global database also is utilized. All objects in the database are organized into a single information structure, like one enormous map.

AM/FM systems, based upon microcomputer technology, are providing significant mapping capabilities at a fraction of the cost of previous systems. Hardware technology is only part of the reason. Microcomputers are the basis for an entirely different approach to AM/FM applications. Fully functional and fully independent workstations can interact with a non-graphic host database system to provide a total mapping solution. This system architecture makes the benefits of AM/FM applications affordable and provides an effective means for integrating new information with existing primary systems. □



Joseph H. Cooper is vice president of product development for A/SA Software, Austin, Texas.

Troubled Times For Landfill Gas

Declining revenues and a new emphasis on environmental controls are spelling hard times for the landfill gas recovery industry.

By Bill Eldred

Photo by Terri Teague

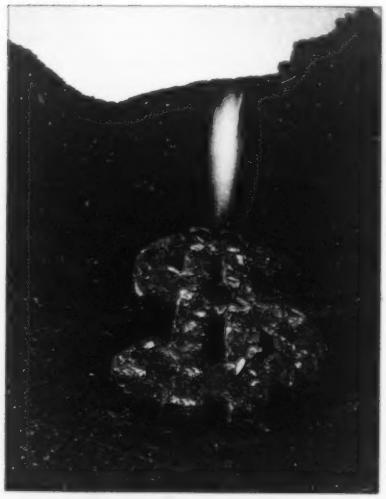
In a quiet Seattle neighborhood, 12 homes require evacuation when methane leaking from the nearby Midway landfill is detected in basements.

In Madison, Wis., an apartment building explodes when a tenant lights a cigarette, igniting methane gas suspected of migrating underground — slowly and silently — from the Green Hills landfill, just 100 yards away from the building.

And a smoldering landfill in Jersey City, N.J., casts a mysterious pall of smoke over an urban neighborhood, forcing state officials into emergency action to extinguish the blaze.

The fledgling landfill gas recovery industry has been troubled in 1986. After years of sustained expansion, revenues now are declining along with fuel prices in the worldwide energy downturn. And support is growing for controlling methane and air toxins emitted from landfills at a time when the industry can least afford to buy equipment needed to control these substances. Indeed, a major shift may be in store for the landfill gas industry, from methane recovery to pollution control. Spending for pollution control systems soon may outpace investment in recovery, especially if the energy recession continues and government rules change.

Calls for better control of landfill air emissions are being heard in several states where accidents and contamination have focused public attention on the role of landfills in polluting air and posing literally explosive dangers to life.



Pollution scenarios such as those in Seattle, Madison and Jersey City have convinced many that landfills are not passive neighbors, but active threats posing danger to health and safety. Concern is acute in California, where housing tracts with landfills literally in their backyards are commonplace.

Developing rules and engineering designs to combat landfill air pollution promises an acrimonious debate: advocates of controls often are at loggerheads with methane recovery vendors who fear the new regulations, and the equipment required to meet these standards, will reduce methane yields and reduce profits. Lowering profits, vendors say, ultimately will hurt pollution control because landfill operators will be stripped of funds for installing pollution equipment that vendors regard as "reasonable."

Industry representatives acknowledge the need for controls to limit risks of methane explosion, but add that control should be balanced to avoid disrupting the economics of methane recovery. Failure to take a "reasonable" approach, vendors say, could hurt an industry already suffering the impacts of an energy recession.

Landfills nurture delicate ecosystems, generating more than 200 billion cubic feet of methane, carbon dioxide and trace gases daily. Methane, identical to natural gas, has commercial value if cheaply drawn from landfills and refined to meet the specifications for its main uses: fuel for electric or steam-heat generation and sale to gas utilities after purification.

Industry representatives estimate 500 to 700 of the nation's 10,000 landfills are ripe for commercial exploitation. The sheer volume of energy in landfills is surprising: a 40-acre, 100-foot-deep fill makes about 1 million cubic feet of

gas daily — enough to light 3,500 homes and to earn revenue of $1 million annually in top energy markets. Gas yields can last from 15 to 25 years.

Gas generation rates vary widely, ranging from 80 to 280 cubic feet of gas per ton yearly for each ton of garbage landfilled. How much gas is created depends on rainfall, temperature, the "organic" content of garbage and how closely the garbage is packed. Methane content in landfill gas ranges from 50 to 67 percent of the total, with the balance composed of carbon dioxide, hydrogen sulfide, water vapor, hydrocarbons and trace substances.

The methane recovery industry has enjoyed rapid growth since its birth a little more than a decade ago. Ellen Bogardus, a CH2M Hill solid waste engineer, says recovery is an old idea that became practical when the energy crisis quadrupled fuel prices during the 1970s. Methane was first recovered commercially at the Palos Verdes landfill near Los Angeles in 1975. Since then, the industry has grown exponentially. Today, plants are being operated or planned by 152 cities and 62 counties in 28 states.

Profile data published by the Government Advisory Services' *Methane Recovery Yearbook* reveal a complex national industry. Twenty-four vendors now compete to tap the 15 billion cubic feet of exploitable gas generated by the nation's landfills. Since only 15 percent of these reserves are being captured, room for expansion clearly exists, if and when market conditions improve.

According to the yearbook, the "average" landfill currently being tapped for gas recovery holds 5.5 million tons of refuse spread over 150 acres to a depth of 80 feet. Two million cubic feet of gas is yielded per day and recovery systems cost about $3.3 million to install and $200,000 per year to operate. National investment in methane recovery will soon top $500 million, with 90 percent privately held. Landfill owners receive royalties of 10 to 20 percent of energy sales revenues and vendors sell methane, steam heat or electricity in local energy markets at widely varying prices.

The yearbook says three-fourths of recovery projects produce electricity by using methane to fuel engine- or turbine-driven generators. Industry representatives say producing electricity can be profitable because landfill gas needs little preparation to fuel generators, and processing costs are comparatively low.

Another recovery option refines landfill gas to natural gas quality by removing carbon dioxide, water vapor, and trace contaminants. The product then is sold to gas utilities, or used in industrial processes requiring pure methane. Production of this high-quality gas is less common because purification costs are high and utilities often are reluctant to purchase the gas. Still other recovery projects use methane to fuel steam boilers for heating buildings or creating process steam for industry. The steam option requires users to be located close to landfills.

Bogardus, who also chairs the landfill gas committee of the Governmental Refuse Collection and Disposal Association (GRCDA), says landfills ripe for methane recovery should have at least 1 million tons of garbage in place and be filled to a depth of 40 feet over a 40-acre area. Wells are drilled to recover methane from the landfill. The wells usually extend from 50 to 90 percent of the depth and are spaced at regular intervals.

Bogardus says the economics of recovery are helped if an energy user is located close to the landfill. Then, the cost of transporting the energy product — gas, steam or electricity — is reduced greatly. Bogardus urges vendors to weigh project economics carefully before deciding how to use the energy potential of methane. The capital costs of producing methane of high- and medium-heat value usually are balanced against revenue expected from sales of steam, electricity or natural gas. Industry analysts say revenue from energy sales varies widely and depends on local market conditions.

Gary DeFranco of United Environmental Services (UES) is enthusiastic about methane recovery, but he says "the economics must work. If you're dealing with utility companies that want electricity and are willing to pay for it, you've got it made."

UES generates 3 million watts of power harnessed from Long Island and New Jersey landfills. The economic climate, DeFranco says, is most favorable in New York and Pennsylvania where laws establish "price floors" for power bought from landfill plants. The six to nine cents per kilowatt hour paid by Long Island Lighting Co. makes investing in recovery worthwhile, DeFranco says. But in states such as New Jersey, prices to vendors are based on "avoided costs" with no minimums. Industry sources cite four cents per kilowatt hour as the bare minimum at which recovery can be profitable.

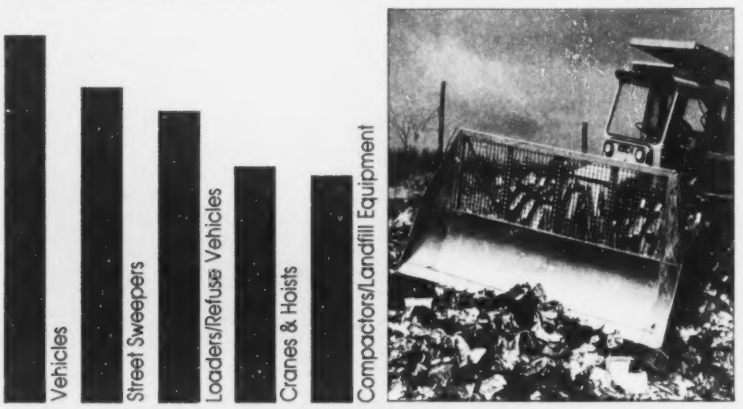
Other industry representatives echo DeFranco's view that recovery works best where energy prices are high or where expanding population puts a premium on gas and electric supply, making utilities hungry for power. The *Methane Recovery Yearbook* shows almost 75 percent of the nation's 138 planned or existing methane recovery plants are located in six East Coast states and in California, the national leader with 51 plants. New York has 16 plants, Rhode Island and New Jersey have eight each, Michigan has six and Florida has five. Since 1984, the number of plants in the nation has almost doubled.

But this year, robust expansion of this young industry is being challenged by the 30 percent decline in energy costs affecting gasoline and other fossil fuels, including natural gas. The effects are being felt nationwide, but no plants have closed and industry sources say none are expected to shut down operations.

"The industry is now entering a dormant phase," says Ronald J. Lofy, a California-based consultant specializing in recovery projects, "with many projects being put on the back burner." Lofy has noticed attendance at industry conferences has dropped off, indicating a slackening of interest in recovery. He also sees interest shifting to gas collec-

Solid Waste Collection and Disposal

In a recent survey, *American City & County* readers were asked their responsibility in purchasing new equipment for solid waste collection and disposal operations. A total of 180 public works directors and city managers took part in this national sampling.



Landfill Siting and Public Involvement

Most communities do not give much thought to trash disposal until the local sanitary landfill is full and it is time to develop a new one. Then the landfill is suddenly a topic of heated debate. While choosing the site for a new sanitary landfill traditionally has been an uphill battle, Maricopa County, Ariz., found the process improved when the public was informed and involved.

Initially, the county did not envision any significant difficulties in identifying a site for the landfill since the study area consists largely of undeveloped farmland or desert land outside Phoenix, according to Deputy County Engineer Wayne Collins. But that was before the first public meeting drew about 400 angry residents opposed to the scheme.

County Supervisor Carole Carpenter recalls when she walked into the meeting, "people were yelling that they did not want a landfill sited anywhere near the locations then being considered by the county."

The message got through loud and clear. The county promptly expanded the site selection study area and, at the same time, implemented a broader-based public involvement program, enabling area residents to play a pivotal role in the siting process.

Public input to the site selection process was obtained through advisory and steering committees as well as a series of public meetings. The 28-member advisory committee consisted of representatives of local municipalities, area residents, homeowners' associations, real estate developers, the farming community, water interests and other "stakeholders" in the siting area.

As the district's elected official, Carpenter also played an active role in the siting process. She focused her efforts on making sure the county was giving adequate information to citizens through the public meeting process, the media was kept informed and the public advisory committee was placed in the forefront of the process.

"The key was not to avoid a heated debate, but to understand that such debates are a part of the process," says Carpenter. "They allow people to vent their feelings and ultimately, down the road, to arrive at a consensus about a landfill site that is not only environmentally sound, but one that is socially acceptable."

The public appreciated the need for a new landfill, but opposed sites near individual homes and businesses, says Marty Rozelle of Dames & Moore, which served as the site selection consultant. Area residents also were concerned about the long-term effects of a landfill on property values, water quality, traffic congestion and the quality of life in their desert environs.

The goal was to find a suitable landfill to serve the area for 50 years. First, a regional inventory identified areas where a landfill would be appropriate. From an original list of 24 potential sites, seven locations were selected for further review. These sites were analyzed on the basis of specific site selection criteria identified by project staff and advisory committee members. Among the criteria were impacts on water quality, existing and future land uses, traffic congestion, air quality, user costs, and air quality.

Getting local people involved with the study proved to be the key, says Collins. "We weren't getting anywhere until we got people in the area involved in the study, and they started dealing with the issues. Through the public meetings, they learned about landfills, and they educated us about their neighborhoods and what was important to them."

After thorough consideration of all the siting criteria, advisory committee members and project staffers reached a consensus and recommended a 1,000-acre site near the town of Surprise. Two public hearings then were held to obtain public comments, with nearly all comments supporting the recommended site. In fact, when the County Board of Supervisors met to vote on the site, not one objection was raised from the estimated 150 people in attendance.

The public involvement process takes time, says Carpenter, but people should recognize "a year or so is not a long time to go through a successful process for siting and starting up a landfill." □

tion systems to keep methane within landfills. But he sees continued interest in recovery systems, and says he is sure recovery will continue, and play an important role in paying for gas control equipment.

Tom Shuput, market services coordinator for GSF Energy Inc., says market conditions have forced a lowering of high-quality methane prices sold to gas companies, and a discounting of electrical rates to keep pace with the competition. When utilities are paying less for natural gas and for fuel to generate electricity, he says GSF must match or beat the prices. In California, prices paid for electricity have fallen from six cents per kilowatt hour to four cents, a 30 percent drop.

To make up for lower revenues, Shuput says many vendors are tightening royalties paid to landfill owners, who typically receive 10 to 20 percent of methane or electricity sales. Another step, Shuput says, is finding cheaper and more efficient ways of removing carbon dioxide and other impurities from landfill gas, creating a refined product with higher heating value.

GSF has installed the latest "pressure swing absorption" technology at a new plant in Cincinnati, using special pellets that absorb carbon dioxide as they are heated, then discharging the gas into separation vessels when cooled. The new system, according to Shuput, is somewhat less expensive, and an economy move necessary in today's marketplace.

Not all vendors are feeling the effects of lower energy prices. Some reap benefits from high-price contracts negotiated when energy markets boomed. Tony Henrich of Pacific Lighting Energy Systems says a 10-year contract will pay his firm up to seven-and-a-half cents per kilowatt hour. About 80 percent of the contract's cost basis is fixed, he says, and 20 percent is based on variables like avoided costs.

Ironically, issues key to the prosperity of the industry are those over which it has least control: fluctuating energy prices and impending pollution regulations. These factors have segmented the methane recovery market, analysts say, into a state-by-state patchwork in which "sometimes the numbers work and sometimes they don't," as one vendor says.

In some states, support is growing for mandatory control of trace toxins rising from landfill surfaces and containment of methane gases. Already, strict rules have become law in Southern California, geared toward keeping pollution inside landfills and away from residential areas. Wisconsin, Washington, and New Jersey also are considering rules and engineering designs to reduce pollution.

The move causing the most concern is the evaluation by the U.S. Environmental Protection Agency (EPA) of health risks posed by the 90 compounds that landfills emit in minute quantities. Among these are known carcinogens such as benzene and vinyl chloride. When studies are complete, EPA could issue regulations limiting emissions of one or more of these substances. Meth-

ane already is limited by EPA to 5 percent of air volume — its explosion threshold.

"People who design and operate landfills don't know enough about managing methane," says Phil O'Leary, an engineer with the University of Wisconsin. Calling the gas "unpredictable and dangerous," O'Leary says methane can find its way through seemingly impenetrable barriers and move hundreds of feet within hours.

O'Leary, who lives near the Green Hills landfill in Madison, is interested in landfill designs and operating practices to make them good neighbors. He says methane is likely to migrate underground if a capped landfill blocks its escape. "Methane will follow a path of least resistance," he says, "often along sand or gravel deposits in soils."

Methane can travel up to 1,000 feet and further with rainfall, dropping barometric pressure and frozen ground. Investigators of the explosion near the Green Hills landfill think rainfall may have played a role in forcing migrating methane into basements. And in Seattle, methane was discovered in the basements of homes as far as a half-mile from the Midway landfill.

Industry representatives tout "passive" and "active" methane collection systems they say pose solutions to the danger of methane moving from landfills. The systems use a series of deep wells that passively vent methane into air and dilute it, or pump the gas actively into collection systems for flaring. Sometimes, trenches filled with porous rock are used to help vent gas, or wells are installed at the landfill edge to vent or pump, preventing escaped fugitive gases.

"People who design and operate landfills don't know enough about managing methane."

But the collection systems described by O'Leary can damage methane recovery plants if gases are pulled aggressively from the landfills. When gas is pumped out faster than bacteria can replenish the supply, outside air is pulled into the landfill. This condition can dilute the quality of methane recovered, and at worst, kill methane-producing bacteria deep in the landfill.

Using collection systems in tandem with recovery is becoming more common, observers say, because recovery systems alone cannot capture enough gas to eliminate danger of off-site migration. But Borgardus says the tandem systems are needed as backup to control gas during recovery downtime. She says the two systems can work well together if they are carefully designed.

Denny Clark worries about the safety of his children growing up near the Midway landfill, a Superfund site. Clark says an underground plume of methane and trace toxins has spread 100 feet from the fill when first detected in 1983 to a half-mile radius. Now, Clark says property values in the neighborhood of 1,000 homes have dropped and people are concerned.

Clark lauds Seattle for its aggressive efforts to solve problems with gas monitoring probes and wells installed around the neighborhood to vent methane into the air. Clark says the system is reducing methane levels in soils around homes, but wonders if traces of benzene and toluene being discharged from the ground with methane are safe. And when flares burning methane at the landfill collection system go out, Clark says "the neighborhood stinks.

"People should be aware of the consequences of landfills," he continues, pointing out that the Midway landfill started out as a model site, going awry when toxins were dumped there illegally. Now, he concludes, only continued safeguards will keep the dangers at bay.

In Southern California, where landfills encroach on residential zones more closely and commonly than anywhere, regulators have developed the nation's strictest limits on methane and hydrocarbon emissions.

Fred Lettice, supervising air quality engineer with the South Coast Air Quality Management District, says regulations are designed to limit gas emissions into air and ground. The program requires analysis of gases sampled from collection systems, landfill surfaces and perimeter gas probes. A key provision

Iron Topping Extends Floor Life

The San Mateo County, Calif., tipping-floor transfer station, believed to be the world's largest with 82,000 square feet, processes 1,500 tons of refuse per day. The indoor solid-waste transfer station, built for $15 million in 1984, was designed to replace several public dumps and is the central dumping site for residents of 10 cities.

The station also serves the needs of Browning-Ferris Industries (BFI), which built the facility. Waste is deposited at the San Mateo County "Scavenger" 14 hours a day, seven days a week.

The space is rotated between garbage trucks and private individuals. When a sufficient amount of waste is collected, front-end loaders push the material into four large slots in the floor, where tractor-trailer trucks are loaded with the debris, before hauling the waste to a dump site 20 miles away.

"We get everything here," says Lou Devincenzi, BFI president, "from soup to nuts — engine blocks, trees, glass, metals." The scraping of this debris across the floor contributes to the wear and tear of the surface. Repetitive traffic patterns of the front-end loaders, crawler treads, refuse dropped from route trucks and routine abrasion from the front-end loaders' blades put extreme demands on the floor surface. When planning the facility, Devincenzi says the floor was the most important consideration.

The station's designers specified Anvil-Top 200-1, an iron-aggregate metallic floor topping, manufactured by Master Builders. The topping was used on 30,000 square feet immediately surrounding the four loading slots. An iron-aggregate dry-shake floor hardener was used on the ramps, aprons and more remote areas where conditions were less severe.

As waste tonnage escalates and environmental constraints halt the use of outdoor dumps in favor of sanitary landfills and mass-burn operations, refuse facility floors will need to be more abrasion and impact resistant. Conventional concrete remains the least expensive base material to use for flooring, but a concrete surface rarely will withstand the common forces and demands required in the solid waste industry, say facility designers.

"The floor has been in place for 2½ years now," Devincenzi says, "and the floor topping has been our answer to the scraping of the floor. The material is very tough and resists the digging in and gouging out — the blades just skim over the top of the concrete. Without it, we would have replaced the floor probably twice already." □

limits hydrocarbons — methane and non-methane substances including trace toxins — to 500 parts per million (ppm), for "points" on the landfill and an average surface level of 50 ppm. Lettice says these strict rules are needed to protect the health of residents living near landfills, who might be harmed by long-term exposure to even tiny amounts of toxins.

Lanny Hickman, executive director of the GRCDA, is critical of South Coast pollution standards he terms unrealistic, saying they represent a "one-dimensional viewpoint."

New regulations will "require analyzing a whole array of chemicals at great expense," Hickman says, and methane gases will be diluted by aggressive collection systems. The solution is a balance of the economics of recovery with air pollution goals, he says.

Balance may indeed be a key survival strategy for an industry buffeted by tightening economics and demands on scarce resources by new regulations. If regulations are applied selectively and reasonably, as industry representatives hope, and the energy recession eases, then chances are good the industry will emerge from these troubled times leaner and meaner. But if economics and regulations combine to squeeze the industry for long, progress in methane and gas recovery could stall, or at worst, reverse. □

Emissions Studied

The effects of emissions on the agricultural community normally are not a part of the permitting process for a waste-to-energy facility, but the $110-million Stanislaus County facility, located near Modesto, Calif., made such a study necessary.

The San Joaquin Valley is one of the richest agricultural regions in the country, and citizens and governmental officials wanted to know the impact of the facility's operations on crops.

Timing of the environmental reports was crucial, since the project sponsors had to meet specific deadlines to take advantage of available funding and escrow financing. The reports, which can take up to three years to complete, were finished in nine months. Included were the environmental impact report, health risk assessment, new source review, prevention of significant deterioration and other environmental permits.

A study by Radian Corp. predicted the emissions within 15 miles of the proposed plant, and estimated the absorption level for plants, water and soil, as well as by animals and people. From the findings, the Stanislaus County Air Pollution Control District and local health officials concluded the health risk was within acceptable limits and approved the facility's construction.

The facility, a joint venture of Stanislaus County, Modesto and Ogden Martin Systems, will be completed in early 1988 and will convert 800 tons of refuse per day into 15 megawatts of electricity, equivalent to the annual electrical consumption of 7,000 homes. □

Bill Eldred is a principal planner with Louis Berger and Associates, consulting engineers, East Orange, N.J.

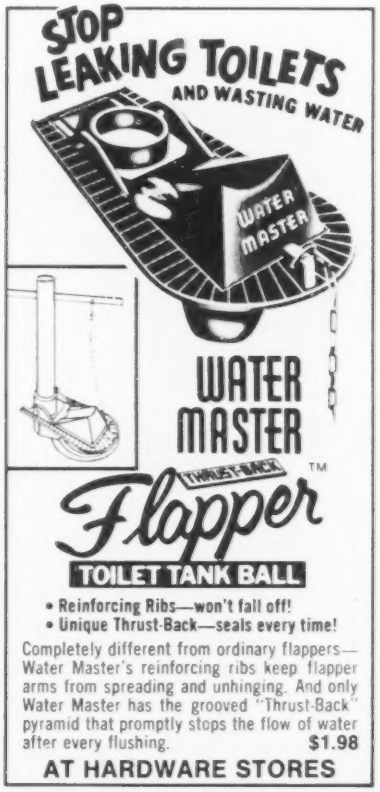
Replace old pipes faster, better.

Insituform is the fast, clean, safe, cost-effective way to replace sewers and other pipeline systems. Here's why Insituform is better. **Long lasting.** Structurally sound Insitupipe™ will last as long or longer than the pipe it replaces. It is corrosion-resistant and has no joints to fail and leak. Its smooth interior normally increases flow capabilities.

No digging involved. No digging means pipes can be replaced in *days* or *weeks* — not months or years — with little or no disruption to people or traffic. **Fiscally and politically sound.** To learn why cities and industrial firms are switching to this non-disruptive, politically and fiscally sound pipe reconstruction process, write or call today.

The Sensible Solution
INSITUFORM®
OF NORTH AMERICA, INC.
3315 DEMOCRAT RD. DEPT. A-1286 • MEMPHIS, TENNESSEE 38118 • (901) 363-2105 1/3-B

Circle No. 13 On Reader Service Card


STOP
LEAKING TOILETS
AND WASTING WATER
WATER MASTER
WATER MASTER
THRUST-BACK™
Flapper
TOILET TANK BALL
• Reinforcing Ribs—won't fall off!
• Unique Thrust-Back—seals every time!
Completely different from ordinary flappers—Water Master's reinforcing ribs keep flapper arms from spreading and unhinging. And only Water Master has the grooved "Thrust-Back" pyramid that promptly stops the flow of water after every flushing. $1.98
AT HARDWARE STORES

Circle No. 14 On Reader Service Card

MUNICIPAL COST INDEXES

The **Municipal Cost Index** for December rose one point from last month, leveling at 340.7. This represents a nearly five-point climb from last year's figure of 336.0. The **Construction Cost Index** also rose from November, climbing slightly to 379.2. The **Consumer Price Index** jumped to 330.2, a rise of almost two points, and the **Producer Price Index**, while down almost 10 points from last year's figure, climbed slightly to 297.7.

In this month's marketbasket, products in the fuel and oil family continued slight gains made during the past two months, but are still down 40 to 50 percent from last year. Electrical components also posted gains in December, while passenger cars and trucks showed losses.

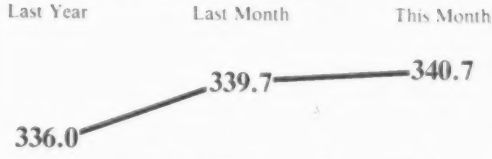
— Compiled by Joe Morris

THIS MONTH'S MARKETBASKET

	Current Index	Percent Change From: Last Month	Last Year
Air Conditioners	149.2	0	1.3
Apparel	185.4	.1	1.3
Asphalt Roofing	385.8	−.4	−5.1
Books	140.3	.4	4.8
Chemicals, Industrial	315.3	.1	−7.9
Coal	538.0	0	−2.0
Concrete Products	324.9	0	.6
Construction Machinery	366.9	−.1	1.1
Diesel Fuel	360.7	18.7	−42.5
Electric Components	202.9	.2	2.7
Electric Lamps	344.8	−1.0	−.6
Electric Power	467.2	0	1.1
Engines, I.C.	353.8	−.1	1.7
Fans, Blowers	365.8	.1	1.7
Fertilizers, Mixed	249.6	−1.1	−3.4
Floor Coverings	193.8	−.2	1.7
Flow Instruments	237.4	.4	2.3
Footwear	261.9	−.1	1.2
Foundry Products	361.7	−.1	−.6
Fuel Oil No. 2	393.7	11.4	−41.4
Furniture	318.4	.1	2.1
Gasoline	338.6	9.0	−39.8
Generator Sets	353.5	.1	.6
Glass	232.5	−.7	2.6
Glass Containers	400.8	.2	3.6
Gypsum Products	338.4	−1.6	2.2
Hardware	306.0	−.3	−.2
Heating Equipment	271.3	.9	3.7
HVAC Controls	128.0	−.8	1.1
LP Gas	290.9	−2.0	−44.6
Lubricants	358.3	−2.0	−2.7
Lumber	312.1	.1	3.0
Metal Fabrications	317.2	0	.7
Millwork	322.1	.1	2.7
Motor Vehicle Parts	357.9	.0	.4
Mowers	263.4	−.3	.7
Natural Gas	1129.3	−2.5	−17.0
Office Machines	154.4	−.1	.5
Paint	282.4	0	1.9
Paper	308.9	.5	1.7
Passenger Cars	223.1	−4.0	6.4
Plumbing Fixtures	324.8	.7	3.5
Plywood	235.6	1.0	2.3
Portland Cement	349.7	.1	−2.5
Residual Fuel	417.6	15.7	−53.1
Sand, Gravel	319.5	0	3.1
Sanitary Papers	383.6	.1	1.2
Soaps, Detergents	270.9	−.5	−1.4
Sporting Goods	208.1	.3	1.9
Steel Mill Products	350.1	.2	−4.1
Struc. Clay Products	311.0	.9	4.2
Switchgear	286.9	.1	1.7
Tires, Tubes	234.0	.2	−1.0
Transformers	234.1	.1	.4
Trucks	335.2	−3.7	5.8
Valves	107.1	.2	1.6
Wire, Cable	205.6	.1	−.3
Wiring Devices	379.1	1.1	4.4

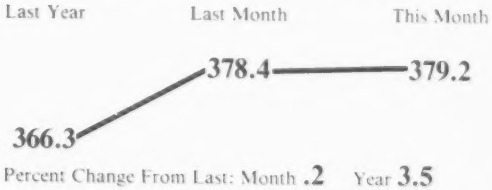
At-A-Glance Changes

MUNICIPAL COST INDEX



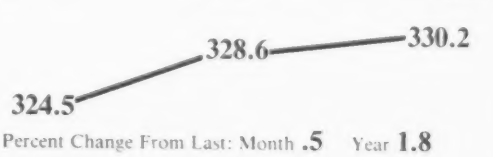
Percent Change From Last: Month .3 Year 1.4

CONSTRUCTION COST INDEX



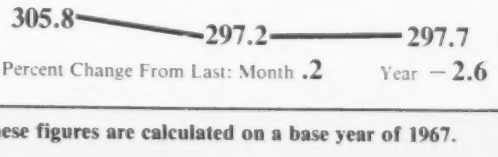
Percent Change From Last: Month .2 Year 3.5

CONSUMER PRICE INDEX (BLS)



Percent Change From Last: Month .5 Year 1.8

PRODUCER PRICE INDEX (BLS)



Percent Change From Last: Month .2 Year −2.6

These figures are calculated on a base year of 1967.

QUARTERLY MUNICIPAL TRENDS

	Current Level	Percent Change From: Last Qtr.	Last Year
Receipts	611.6B	.5	6.9
Federal Grants	106.9B	3.3	8.7
Durable Purchases	22.4B	2.3	9.3
Consumables	36.7B	−5.2	−4.4
Services	372.0B	1.8	7.8
Structures	62.1B	12.9	14.6
Salaries, Wages	297.8B	1.7	7.2
Surplus	59.0B	−15.7	−.3
Employment	13.770M	.1	1.1